

Arthropod Ectoparasites and Their Seasonal Occurrences on *Microtus ochrogaster* and *Peromyscus leucopus* From Warren County, Kentucky

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ABSTRACT

A total of 150 *Microtus ochrogaster* and 155 *Peromyscus leucopus* was examined for arthropod ectoparasites from November 1970 through November 1971. Fourteen species were found on both *M. ochrogaster* and *P. leucopus*: the mites *Ornithonyssus bacoti*, *Androlaelaps fahrenheitsi*, *Laelaps microti*, *Dermacarus hypudaei*, *Listrophorus leukorti*, *Mycoptes* sp., *Euschoengastia peromysci* and *Neotrombicula caviola*; the tick *Dermacentor variabilis*; the fleas *Ctenophthalmus pseudagyrtes*, *Epitedia wenmanni*, *Orchopeas leucopus*, *Peromyscopsylla scotti*, and *Stenoponia americana*. The mite *Radfordia lemnina* and the louse *Hoplopleura acanthopus* were found only on *M. ochrogaster*. The mite *Radfordia subuliger* and the louse *Hoplopleura hesperomydis* were found only on *P. leucopus*.

INTRODUCTION

Studies on the ectoparasites of the prairie vole *Microtus ochrogaster* and the wood mouse *Peromyscus leucopus* have been sporadic. Most previous studies of the parasites of these rodents have been compilations of lists of parasite species. Whitaker (1968) brought together a literature review for the genus *Peromyscus* which includes an extensive listing of both arthropod and helminth parasites. Information concerning the arthropod parasites of the prairie vole is available from scattered sources, the principal ones being Jameson (1947), Verts (1961), and Whitaker and Wilson (1968). Batson (1965), in a study of the prairie vole, listed some of the arthropod parasites for this species found in central Kentucky.

The purpose of this study was to determine the species of arthropod ectoparasites present on *M. ochrogaster* and *P. leucopus* in south-central Kentucky, to determine if the numbers of those parasites varied with seasonal changes, and to determine the extent of overlap of the parasitic species between the host species.

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MATERIALS AND METHODS

The study area consisted of abandoned pastures and woodlots of approximately 121 hectares in size and was large enough to allow variance of trapping sites to prevent overtrapping. Located in Warren County, Kentucky, the area was approximately 0.8 km south of Bowling Green, east of US Highway 31W.

Attempts were made to trap and autopsy a minimum of 10 *Microtus ochrogaster* and 10 *Peromyscus leucopus* each month from November 1970 through November 1971. Museum Special snap traps and Hav-a-hart live traps were used. Traps were baited with a mixture of peanut butter and oatmeal. During the warm months of the year, DDT was added to the bait to prevent loss to ants (Coleman 1950). Traps were set in the evenings and checked the next morning. Dead animals were placed in individual plastic bags after removal from

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TABLE 1.—ARTHROPOD ECTOPARASITES AND THEIR SEASONAL OCCURENCES ON *MICROTUS OCHROGASTER* IN WARREN COUNTY, KENTUCKY, FROM NOVEMBER 1970 THROUGH NOVEMBER 1971. THE NUMBERS IN PARENTHESES BELOW EACH SEASON AND THE TOTAL INDICATE THE NUMBER OF SPECIMENS EXAMINED. THERE WERE AT LEAST 2 KINDS OF CHIGGERS PRESENT.

Parasite	Average Number Per Host (minimum and maximum number per host)				
	Winter (32)	Spring (34)	Summer (32)	Fall (52)	Total (150)
Mites					
<i>Ornithonyssus bacoti</i>	0.03 (0-1)	4.23 (0-42)	71.37 (0-516)	15.36 (0-257)	23.12 (0-516)
<i>Androlaelaps fahrenheitzi</i>	0.62 (0-4)	5.91 (0-50)	5.50 (0-31)	3.96 (0-26)	4.90 (0-50)
<i>Laelaps microti</i>	7.84 (0-41)	9.47 (0-119)	3.81 (0-33)	4.78 (0-34)	6.31 (0-119)
<i>Radfordia lemnina</i>	0	0	0.06 (0-1)	0.11 (0-1)	0.05 (0-1)
<i>Dermacarus hypudaei</i>	106.43 (0-1061)	315.26 (0-1695)	122.21 (7-769)	114.55 (0-597)	161.00 (0-1695)
<i>Listrophorus leukorti</i>	136.46 (0-1279)	49.20 (0-778)	114.37 (0-816)	510.65 (0-2169)	225.49 (0-2169)
<i>Mycoptes</i> sp.	1.96 (0-27)	2.70 (0-27)	0.62 (0-10)	0.96 (0-13)	1.56 (0-27)
Chiggers	11.68 (0-34)	18.23 (0-102)	0.25 (0-3)	7.07 (0-94)	8.33 (0-102)
Ticks					
<i>Dermacentor variabilis</i>	0.06 (0-2)	0.50 (0-9)	0.21 (0-5)	0.11 (0-1)	0.21 (0-9)
Lice					
<i>Hoplopleura acanthopus</i>	0.22 (0-15)	8.35 (0-72)	0	0.32 (0-21)	2.62 (0-72)
Fleas					
<i>Ctenophthalmus pseudagyrtes</i>	0	0.32 (0-3)	0.25 (0-3)	0.59 (0-4)	0.32 (0-4)
<i>Epitedia wenmanni</i>	0	0	0	0.03 (0-1)	0.01 (0-1)
<i>Orchopeas leucopus</i>	0.03 (0-1)	0	0	0	0.01 (0-1)
<i>Peromyscopsylla scotti</i>	0	0	0.03 (0-1)	0	0.01 (0-1)
<i>Stenoponia americana</i>	0.03 (0-1)	0.35 (0-7)	0	0.13 (0-4)	0.12 (0-7)

the traps. Live animals were killed by cervical dislocation prior to being placed in the bags.

In the laboratory, the animals were washed in a detergent solution and the pelage thoroughly brushed with a toothbrush to dislodge the ectoparasites. The plastic bag for each animal was rinsed with water and this was added to the detergent

solution used to wash the animal. The mixture was then filtered through coarse filter paper. The ectoparasites were removed from the filter paper and preserved in 70 percent ethanol. Each animal was examined under a dissecting microscope and attached parasites were removed and placed with those obtained from the wash. The parasites were identified to species

where possible and the numbers of individuals of each species were recorded. Whole mount preparations were made of representative individuals of each species by mounting the specimens in Polyvinyl alcohol-lactophenol.

RESULTS

During the 13-month period of this study, 150 *Microtus ochrogaster* (77 males and 73 females) and 155 *Peromyscus leucopus* (77 males and 78 females) were examined for ectoparasites. The number of *M. ochrogaster* trapped per month ranged from 9 to 17 and the number of *P. leucopus* ranged from 10 to 14.

Sixteen species of arthropod ectoparasites were found on *M. ochrogaster* (Table 1). The greatest numbers of species were mites: *Ornithonyssus bacoti*, *Androlaelaps fahrenheitzi*, *Laelaps microti*, *Radfordia lemnina*, *Dermacarus hypudaei*, *Listrophorus leukorti*, and *Mycoptes* sp. In addition to these mites, at least 2 species of chiggers were present: *Euschoengastia peromysci* and *Neotrombicula caviola*. Other arthropods present were the tick, *Dermacentor variabilis*; the louse, *Hoplopleura acanthopus* and 5 species of fleas: *Ctenophthalmus pseudagyrtes*, *Epitedia wenmanni*, *Orchopeas leucopus*, *Peromyscopsylla scotti*, and *Stenoponia americana*.

The most abundant ectoparasite on *M. ochrogaster* was the mite, *L. leukorti*, with an average number for the 13-month study period of 225.49 per animal. It was found commonly throughout the year, but was most abundant in the fall. *Dermacarus hypudaei* was also common on *M. ochrogaster* with an average of 161.0 per animal during the entire study period. However, this species was most prevalent in the spring. The mites *O. bacoti*, *A. fahrenheitzi*, *L. microti*, and *Mycoptes* sp. were also encountered regularly but with decreased numbers of 23.12, 4.90, 6.31, and 1.56, respectively. *Ornithonyssus bacoti* was found most frequently in the spring, *A. fahrenheitzi* was most common in the spring and summer, and *L. microti* and *Mycoptes* sp. were found most frequently in the winter and

spring. *Radfordia lemnina* was encountered rarely, with an average of 0.05 per animal for the 13-month study period. It was found only in the summer and fall. Chiggers, *E. peromysci* and *N. caviola*, were found throughout the year but were most common in the winter and spring. For the entire study period, the average number of chiggers per animal was 8.33.

Ticks and lice were encountered less frequently than mites. The tick *D. variabilis* was most prevalent in the spring and there was an average of 0.21 per animal for the study period. Lice were most prevalent in the spring also, and were not found on the voles during June, July, and August. The average number of those ectoparasites for the study period was 2.62.

The occurrence of fleas was sporadic (Table 1). The highest average number for the study period was 0.32 per animal for *C. pseudagyrtes*. Numerically, the fleas were a minor component of the ectoparasitic fauna.

During the study, 16 species of arthropod ectoparasites were found on *P. leucopus* (Table 2). Of these, 14 were also present on *M. ochrogaster*, indicating a broad overlap in the ectoparasite fauna. The 14 species found on both hosts were: mites—*O. bacoti*, *A. fahrenheitzi*, *L. microti*, *D. hypudaei*, *L. leukorti*, *Mycoptes* sp., and chiggers (*E. peromysci* and *N. caviola*); ticks—*D. variabilis*; and fleas—*C. pseudagyrtes*, *E. wenmanni*, *O. leucopus*, *P. scotti*, and *S. americana*. The mite *Radfordia subuliger* and the louse *Hoplopleura hespermydis* were found on *P. leucopus* but not on *M. ochrogaster*.

The most common ectoparasites of *P. leucopus* were chiggers of which at least 2 species were present. The average number of chiggers per animal throughout the study was 13.76. These arthropods were most common in the winter. The mite *D. hypudaei* was also common with an average number per animal for the study period of 4.87. It was most prevalent in the spring.

Other mites were not as prevalent. *Ornithonyssus bacoti*, *A. fahrenheitzi*, *L. microti*, *R. subuliger*, *L. leukorti*, and *Mycoptes* sp.

TABLE 2.—ARTHROPOD ECTOPARASITES AND THEIR SEASONAL OCCURRENCES ON *PEROMYSCUS LEUCOPUS* IN WARREN COUNTY, KENTUCKY, FROM NOVEMBER 1970 THROUGH NOVEMBER 1971. THE NUMBERS IN PARENTHESES BELOW EACH SEASON AND THE TOTAL INDICATE THE NUMBER OF SPECIMENS EXAMINED. THERE WERE AT LEAST 2 KINDS OF CHIGGERS PRESENT.

Parasite	Average Number Per Host (minimum and maximum number per host)				
	Winter (42)	Spring (33)	Summer (37)	Fall (43)	Total (155)
Mites					
<i>Ornithonyssus bacoti</i>	0.18 (0-5)	2.16 (0-53)	1.72 (0-12)	0.09 (0-1)	0.82 (0-53)
<i>Androlaelaps fahrenheitzi</i>	0.92 (0-17)	0.94 (0-5)	0.27 (0-2)	0.53 (0-6)	0.65 (0-17)
<i>Laelaps microti</i>	0.05 (0-1)	1.03 (0-19)	0.32 (0-9)	0.21 (0-1)	0.38 (0-19)
<i>Radfordia subuliger</i>	0.02 (0-1)	0	0	0.09 (0-2)	0.03 (0-2)
<i>Dermacarus hypudaei</i>	1.30 (0-19)	14.93 (0-424)	0.41 (0-3)	2.28 (0-30)	4.87 (0-424)
<i>Listrophorus leukorti</i>	0.11 (0-1)	1.81 (0-55)	0.27 (0-3)	1.90 (0-30)	1.26 (0-55)
<i>Mycoptes</i> sp.	0.19 (0-3)	0.09 (0-1)	0.18 (0-2)	0.37 (0-8)	0.23 (0-8)
Chiggers	26.83 (0-75)	12.60 (0-75)	2.24 (0-22)	13.04 (0-72)	13.76 (0-75)
Ticks					
<i>Dermacentor variabilis</i>	0.02 (0-1)	1.81 (0-12)	0.13 (0-2)	0.21 (0-3)	0.52 (0-12)
Lice					
<i>Hoplopleura hesperomydis</i>	2.54 (0-25)	0.63 (0-12)	0.73 (0-19)	6.21 (0-252)	2.98 (0-252)
Fleas					
<i>Ctenophthalmus pseudagyrtes</i>	0.04 (0-1)	0.06 (0-1)	0.16 (0-5)	0	0.06 (0-5)
<i>Epitedia wenmanni</i>	0.14 (0-4)	0	0.13 (0-3)	0.02 (0-1)	0.07 (0-4)
<i>Orchopeas leucopus</i>	0.31 (0-4)	0.03 (0-1)	0	0.02 (0-1)	0.08 (0-4)
<i>Peromyscopsylla scotti</i>	0	0	0	0.02 (0-1)	0.01 (0-1)
<i>Stenoponia americana</i>	0.28 (0-6)	0.27 (0-4)	0	0.04 (0-2)	0.15 (0-6)

had average numbers per animal of 0.82, 0.65, 0.38, 0.03, 1.26, and 0.23, respectively, for the entire study period. *Ornithonyssus bacoti* was most prevalent in the spring and summer, *A. fahrenheitzi* in the winter and spring, *L. microti* in the spring, *L. leukorti* in the spring and fall, and *Mycoptes* sp. in the fall. *Radfordia subuliger* was rare and found only in the fall and winter.

Other ectoparasites also occurred in very low numbers on *P. leucopus*. *Dermacentor variabilis* occurred most frequently in the spring with an average of 0.52 per animal for the 13-month study period. The louse *H. hesperomydis* was found most frequently in the fall and winter with an average of 2.98 per animal for the study period. Fleas occurred irregularly (Table 2).

DISCUSSION

A total of 18 species of arthropod ectoparasites was found on *Microtus ochrogaster* and *Peromyscus leucopus* during the present study. Of this total, 14 species (77.7%) were common to both rodents, indicating little host specificity. Host specificity was exhibited only by mites of the genus *Radfordia* and by lice of the genus *Hoplopleura*. There was, however, a definite host preference. The ectoparasites were more numerous on *M. ochrogaster* than on *P. leucopus*. This difference in numbers possibly resulted from the heavier pelage on the voles.

The average numbers of ectoparasites obtained for *M. ochrogaster* and *P. leucopus* were higher than those reported in the literature. Whitaker and Wilson (1968), in a 3-year study of mites in Indiana, reported averages of 0, 0.19, and 0.17, respectively, for *Ornithonyssus bacoti*, *Androlaelaps fahrenheitsi*, and *Laelaps micrati* on *M. ochrogaster* and 0.01, 0.003, and 0.62 on *P. leucopus*, whereas our respective averages were 23.12, 4.90, and 6.31 on *M. ochrogaster* and 0.82, 0.65, and 0.38 on *P. leucopus*. Similarly, the above authors reported averages of 0.02 for *Radfordia lemnia* on *M. ochrogaster* and 0.02 for *Radfordia subuliger* on *P. leucopus*, but our findings show averages of 0.05 and 0.03, respectively. Whitaker and Wilson (1968) pointed out that their figures should be taken as minimal because of the methods used for finding mites. In our study, however, we attempted to collect and count all specimens.

Seasonal variations in numbers of parasites were observed for some ectoparasites. *Listrophorus leukorti* occurred in greater numbers in the fall on *M. ochrogaster*, but showed little seasonal variation on *P. leucopus*. On the latter species, the numbers were much lower throughout the year than on *M. ochrogaster*. *Dermacarus hypudaei* occurred on both *M. ochrogaster* and *P. leucopus* as hypopi, a second nymphal stage with specialized claspers. The adults are free living in the nests of the rodents (Drummond 1957). On both species of

host, the mites were most prevalent in the spring of the year. *Ornithonyssus bacoti* showed a distinct seasonal variation on *M. ochrogaster* but not on *P. leucopus*, where it occurred in smaller numbers. The mites were most prevalent on the vole in summer. This was in contrast to the report of Worth (1950) who found maximum numbers in the spring. However, his studies were conducted in Florida where the optimum temperature for the mites would likely occur earlier.

Chiggers, *Euschoengastia peromysci* and *Neotrombicula caviola*, were common throughout the cooler months with peak numbers during the spring. There was a dramatic decrease in chiggers during the summer months. This seasonal pattern was evident both on *M. ochrogaster* and on *P. leucopus*. Chiggers are the parasitic larval stages of free living mites, and during the spring the larvae leave the host and molt to the free living stages. This type of incidence pattern has been described by Farrell (1956).

Dermacentor variabilis occurred as immature stages, larvae and nymphs, on both hosts. These immature stages were most prevalent during the spring, and this observation follows the life cycle pattern reported by Smith et al. (1946) who found that the activity of the immature forms reached a peak during March, April, and May, after which these forms became rare or absent.

The lice, *Hoplopleura acanthopus* on *M. ochrogaster* and *Hoplopleura hesperomydis* on *P. leucopus*, showed a distinct seasonal variation. *Hoplopleura acanthopus* was most prevalent in the spring and *H. hesperomydis* was most prevalent in the fall. These results are similar to those reported by Cook and Beer (1958) for *H. acanthopus* on *Microtus pennsylvanicus* and *H. hesperomydis* on *Peromyscus maniculatus*. Batson (1965) found *H. acanthopus* to be the most abundant ectoparasite of *M. ochrogaster* in central Kentucky but this was not the case in the present study.

Insufficient numbers of each of the 5 species of fleas were taken to accurately

depict their seasonal incidence. This is true also of many of the mites found during our study. The interpretation of the effects of season upon the numbers of some of the species of ectoparasites present on the hosts is severely limited by the low numbers present. In some instances, an abundance of individuals upon a single host dramatically increased the average number of the parasite for that season. Such occurrences adversely affect the interpretation of the data. Such effects could be overcome by collecting larger numbers of rodents over several years.

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